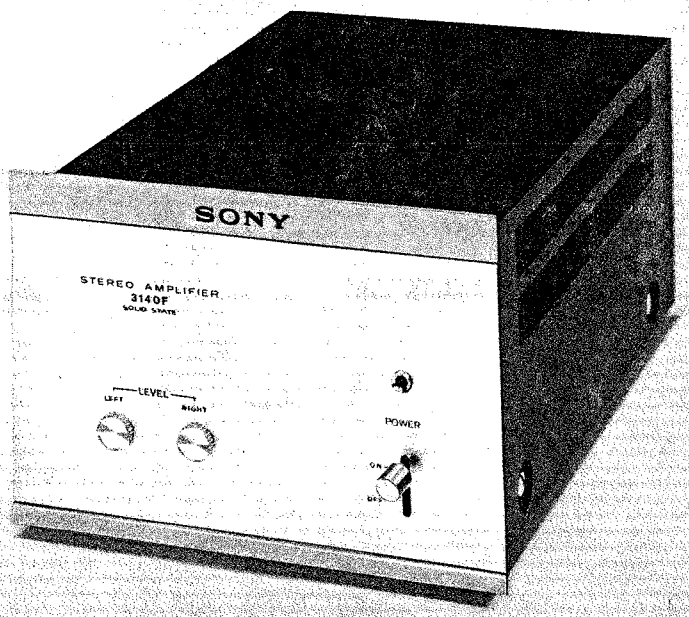
TA-3140F

2378

General Export Model



SONY

SERVICE MANUAL

2378

TABLE OF CONTENTS

	Title	*Page*
SECTION 1.	**TECHNICAL DESCRIPTION**	
1-1.	Technical Specifications	1
1-2.	Detailed Circuit Analysis	1 ~ 3
1-3.	Block Diagram	3
SECTION 2.	**DISASSEMBLY AND REPLACEMENT PROCEDURES**	
2-1.	Tools Required	4
2-2.	Hardware Identification Guide	4
2-3.	Top Cover and Front Panel Removal	4
2-4.	Pilot Lamp Replacement	5
2-5.	Front Sub-Chassis Removal	6
2-6.	Control and Switch Replacement	6
2-7.	Power Transistor Replacement	6
2-8.	Rear Panel Removal	6
2-9.	Replacement of Components Secured to The Rear Panel by Rivets	7
2-10.	Chassis Layout	7
SECTION 3.	**POWER AMPLIFIER ADJUSTMENT**	
3-1.	Dc Bias Adjustment	8 ~ 9
SECTION 4.	**REPACKING**	10
SECTION 5.	**DIAGRAMS**	
5-1.	Mounting Diagram – Power Amplifier/Power Supply Board –	11 ~ 12
5-2.	Schematic Diagram	13 ~ 14
SECTION 6.	**EXPLODED VIEW**	15
SECTION 7.	**ELECTRICAL PARTS LIST**	16

SECTION 1
TECHNICAL DESCRIPTION

1-1. TECHNICAL SPECIFICATIONS

Technical specifications for the TA-3140F are listed in Table 1-1.

TABLE 1-1.
TA-3140F TECHNICAL SPECIFICATIONS

Power Amplifier Section

Dynamic power:	190 watts, both channels operating, 4 ohms 120 watts, both channels operating, 8 ohms
RMS power:	50 watts per channel, both channels operating, 4 ohms 40 watts per channel, both channels operating, 8 ohms
Rated output:	35 watts per channel, both channels operating, 8 ohms
Power bandwidth:	6 Hz to 35 kHz, IHF
Harmonic distortion:	Less than 0.1% at 1 kHz rated output
IM distortion:	Less than 0.1% at rated output
Input impedance:	100 k ohm
Input sensitivity: (for rated output)	0.85 V
Signal-to-noise ratio:	greater than 110 dB (shorted input)
Residual noise:	Less than 0.01 μW (8 ohm)

General

Power consumption:	210 watts
Power requirement:	100, 120, 220, 240V ac, 50/60 Hz
Dimensions:	200 mm (width) x 149 mm (height) x 320 mm (depth) 7⅞" (width) x 5⅞" (height) x 12⅝" (depth)
Net weight:	6.5 kg (14 lb 5 oz)
Shipping weight:	7.7 kg (16 lb 6 oz)

1-2. DETAILED CIRCUIT ANALYSIS

The following describes the function or operation of all stages and controls. The text sequence follows signal paths. Stages are listed by transistor reference designation at the left margin; major components are also listed in a similar manner. Refer to the block diagram on page 3 and the schematic diagram on page 13 to 14.

Stage/Control	*Function*
Level control R501 (R601)	Adjust the input signal to the level required for the following power amplifier to obtain a desired output.
Preamplifier Q501, Q502, Q503	Q501, Q502 and Q503 form a modified paraphase amplifier but output signal is extracted from the emitter circuit of Q502. Note that Q501 and Q502 are in a Darlington configuration. This circuit has various advantages in a direct-coupling system. One is high stability despite temperature variation and another is high input impedance without reducing the amplifier's gain. The ac output appears across load resistor R507 (R607) in the emitter circuit of Q502. A decoupling circuit formed by the emitter-base resistance of Q503, C503 and R510 is essentially a frequency-selective ac bypass circuit to reduce the amplifier's gain at very low frequencies. Common emitter-resistor R509 keeps the dc current flow constant in Q501, Q502 and Q503, thus increasing the dc stability.
Pre-driver Q504	Though this stage is a conventional flat amplifier, it determines the output voltage swings because the following stages are basically emitter-followers. Note that the ac load for Q504 is the collector-emitter impedance of Q506.

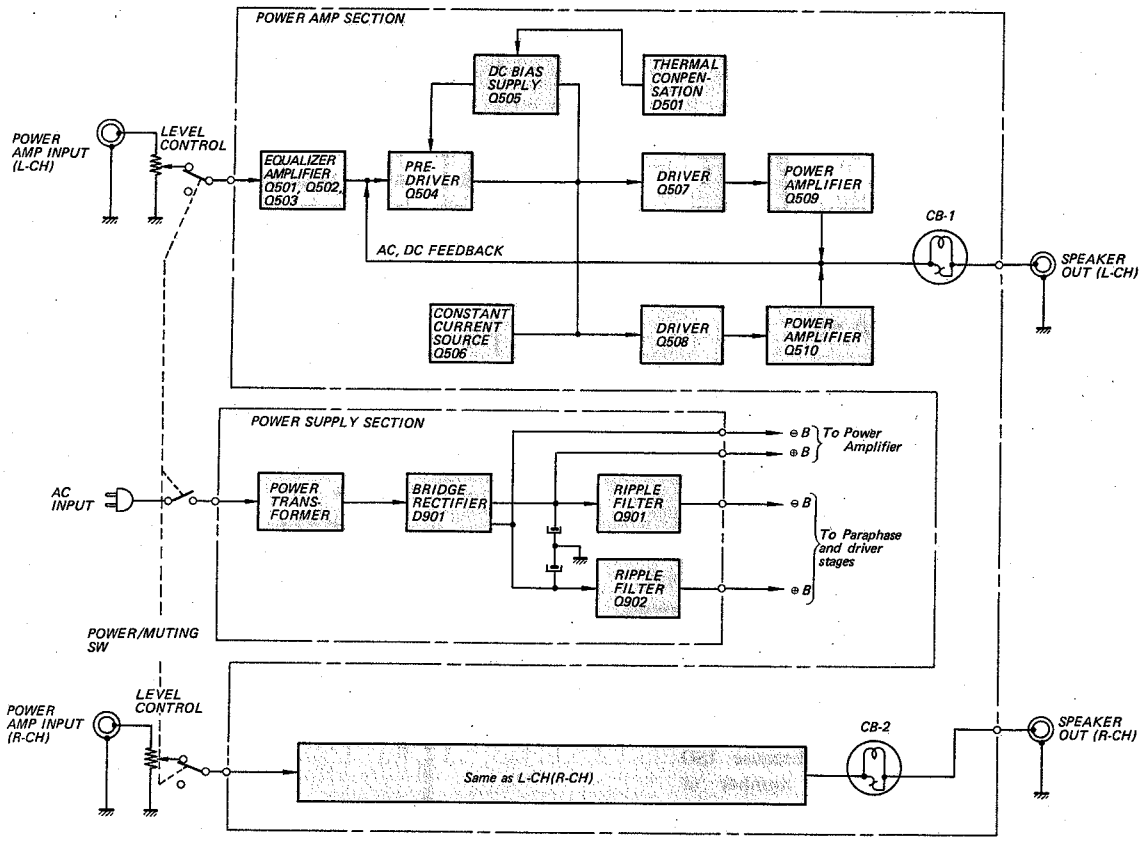
Stage/Control	*Function*
Constant current source Q506	Q506 also acts as a constant-current source, enabling effective drive for the following stages.
Dc bias adj. (idling current) Q505, R514	Q505 is biased into heavy conduction and operates as a small resistance providing the necessary forward bias on the two cascaded emitter-followers. R514 controls the base bias of Q505, determining its emitter-collector impedance and thereby controls the dc bias voltage for the following complementary circuit. This circuit has the advantage of stable operation even at high power output levels.
Thermal dc bias compensator D501	The negative temperature coefficient of diode D501 provides thermal compensation for the idling current in the complementary and power amplifier stages. D501 (D601) is attached to the power transistor's heat sink to detect temperature increases in the power transistors.
Complementary (Driver) Q507, Q508	These transistors operate as emitter-followers to provide the current swings demanded of the output stages, and also provide the necessary phase inversion to drive the power-output stages in push-pull. Phase inversion is performed by using PNP and NPN type transistors.
Power transistor Q509, Q510	The output transistor Q509 and Q510 are connected directly to a power supply of about ±40V. Q509 supplies power to the load during positive half cycle and Q510 operates during the negative half cycle. As all the stages are directly coupled and designed to obtain zero potential at the output terminal, the large coupling capacitor at the output (which may cause power loss or distortion at low frequencies) is eliminated.
Power transistor protection circuit CB-1 (circuit breaker)	To protect overloaded power transistors from destruction, a new circuit breaker which combines a bimetal switch and lamp together is employed. In the event of a short circuit at the output terminals, the excessive current heats the contact points of the bimetal switch, causing the switch open. As the lamp is connected in parallel with the bimetal switch, the excessive current now flows through the lamp. As a result, the breaker lamp lights, and its high resistance limits the excessive current flow down to a low value, thereby protecting the power transistors. When the breaker lamp lights it will be noticed from the outside of the top cover. In addition, the amount of negative feedback decreases when the output terminal is shorted, as R511 is effectively grounded. This increases the sensitivity of the power amplifier, ensuring power transistor protection. Note that the lamp lights only when a relatively large signal is applied while speaker terminal shorted.

Power Supply Section

Rectifier D901	A full-wave bridge rectifier and center-tapped transformer provides positive and negative dc power supplies for the power amplifier.
Ripple filter Q901, R901, R903, C907 Q902, R902, R904, C908	These components reduce the ripple voltages in the dc power supply for preamplifier and driver stages of the power amplifier section to an extremely-low value. Q901 and Q902 serve as an electronic filter to supply well filtered dc of about ±38V to the preamplifier stages.

Stage/Control	*Function*	*Stage/Control*	*Function*
Power/muting switch	Note that the power switch has two functions. One is a conventional power line ON-OFF function, the other is muting operation when power switch is		turned off. Proper muting is performed by shorting input terminal of power amplifier to ground through S.

1-3. BLOCK DIAGRAM



SECTION 2
DISASSEMBLY AND REPLACEMENT PROCEDURES

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

2-1. TOOLS REQUIRED

The following tools are required to perform disassembly and replacement procedures on the TA-3140F.

1. Screwdriver, Phillips-head
2. Screwdriver, 3 mm (⅛") blade
3. Pliers, long-nose
4. Diagonal cutters
5. Wrench, adjustable
6. Tweezers
7. Electric drill
8. Drill bits
9. Prick punch
10. Hammer, ball-peen
11. Soldering iron, 40 to 50 watts
12. Solder, rosin core
13. Cement solvent
14. Cement, contact
15. Silicone grease

2-2. HARDWARE IDENTIFICATION GUIDE

The following chart will help you to decipher the hardware codes given in this service manual.

Note: All screws in this set are manufactured to the specifications of the International Organization for Standardization (ISO). This means that the new and old screws are not interchangeable because ISO screws have a different number of threads per mm compared to the old ones. The ISO screws have an identification mark on their heads as shown in Fig. 2-1.

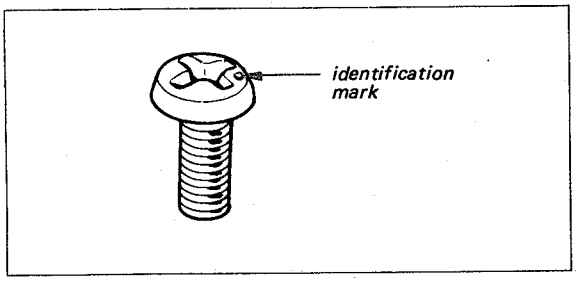
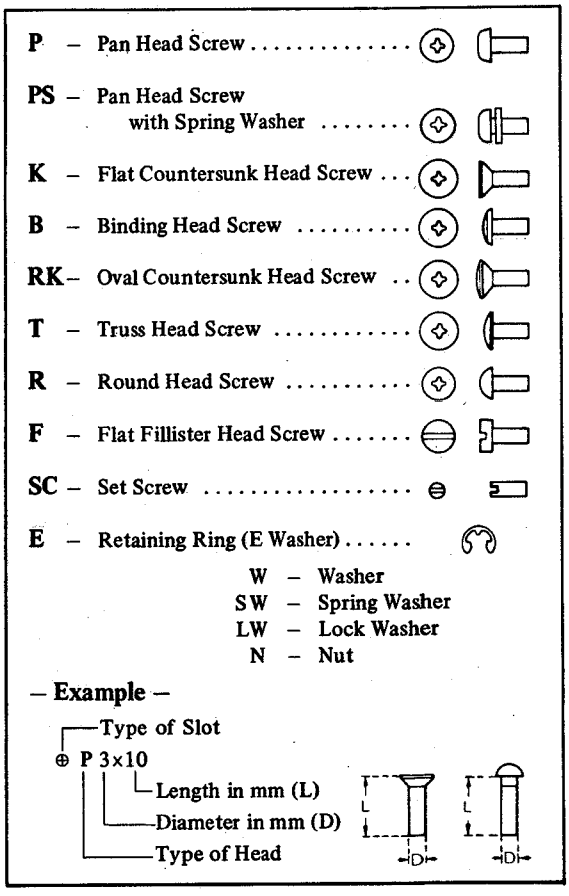


Fig. 2-1. ISO screw

– Hardware Nomenclature –


P – Pan Head Screw
PS – Pan Head Screw with Spring Washer
K – Flat Countersunk Head Screw
B – Binding Head Screw
RK – Oval Countersunk Head Screw
T – Truss Head Screw
R – Round Head Screw
F – Flat Fillister Head Screw
SC – Set Screw
E – Retaining Ring (E Washer)
W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut
– Example –
Type of Slot
⊕ P 3x10
Length in mm (L)
Diameter in mm (D)
Type of Head
L
D

2-3. TOP COVER AND FRONT PANEL REMOVAL

1. Remove the two machine screws at each side of the case, and lift off the top cover.
2. Remove the POWER/MUTING switch knob by pulling it straight out.
3. Remove the two screws (⊕PSW 4x6) behind the top edge of the front sub-chassis as shown in Fig. 2-2.
4. Remove the two self-tapping screws (⊕B 3x6) at the front bottom of the chassis as shown in Fig. 2-3. This frees the front panel.

2-4. PILOT LAMP REPLACEMENT

1. Remove the top cover as described in Procedure 2-3.
2. Straighten the tab of the pilot lamp holder to permit the removal of the pilot lamp socket, then pull out the pilot lamp socket. See Fig. 2-4.
3. Unscrew the lamp from the socket and install a new one. Care should be taken not to lose the black lamp shade.

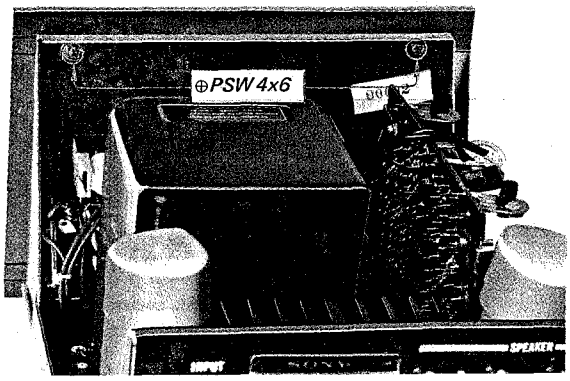


Fig. 2-2. Front panel removal

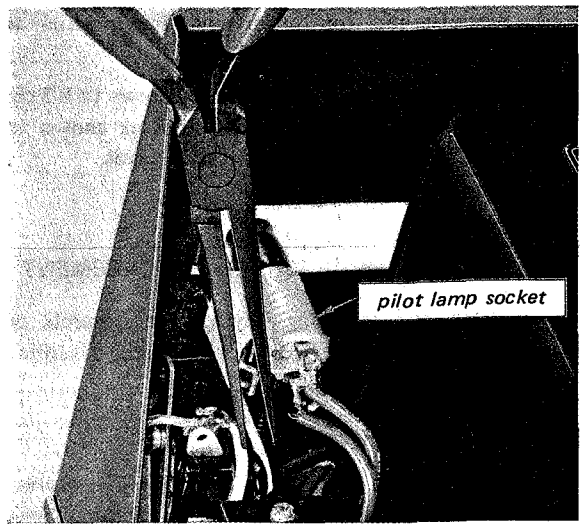


Fig. 2-4. Pilot lamp replacement

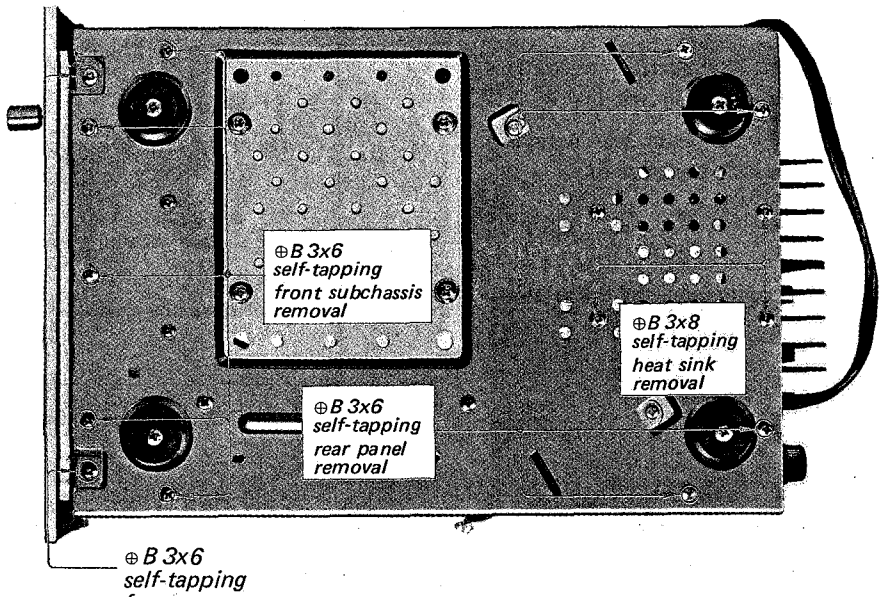

⊕B 3x6 self-tapping front subchassis removal
⊕B 3x8 self-tapping heat sink removal
⊕B 3x6 self-tapping rear panel removal
⊕B 3x6 self-tapping front panel removal

Fig. 2-3. Bottom View

2-5. FRONT SUB-CHASSIS REMOVAL

The front sub-chassis is the vertical member on which the switch and controls are attached.

1. Remove the top cover and front panel as described in Procedure 2-3.
2. Remove the five self-tapping screws (⊕B 3x6) at front bottom of the chassis as shown in Fig. 2-3. This frees front sub-chassis.

2-6. CONTROL AND SWITCH REPLACEMENT

Prepare for replacing any of the controls or switch by removing the front sub-chassis as described in Procedure 2-5.

POWER/MUTING switch

1. Remove the two screws (⊕PS 3x6) securing the defective switch to the front sub-chassis as shown in Fig. 2-5.
2. Unsolder the lead wires from the defective switch, and then install the replacement switch.

LEVEL controls

1. Remove the hex nuts that secure the controls to the front sub-chassis as shown in Fig. 2-5.
2. Unsolder the lead wires from the defective control, and then install the new one.

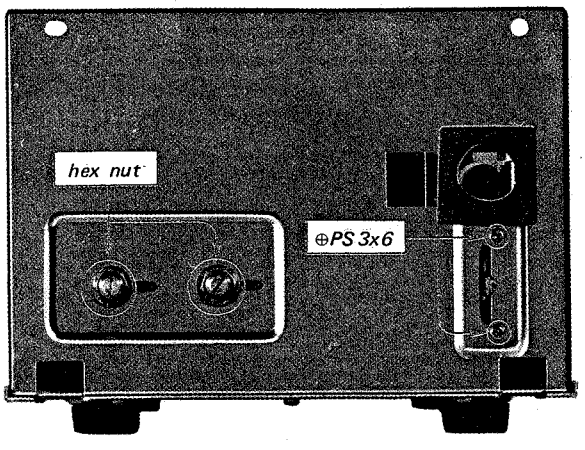


Fig. 2-5. Control and switch replacement

2-7. POWER TRANSISTOR REPLACEMENT

1. Remove the top cover as described in Procedure 2-3.
2. Remove the two self-tapping screws (⊕B 3x8) securing the heat sink to the chassis at the bottom as shown in Fig. 2-3.
3. Remove the two screws (⊕B 3x12) securing the power transistor to the heat sink with its socket as shown in Fig. 2-6.
   Remove the defective power transistor, and then install the replacement.

Note: When replacing the power transistor, apply a coating of a heat-transferring grease to both sides of the insulating mica washer. Any excess grease squeezed out when the mounting bolts are tightened should be wiped off with a clean cloth. This prevents it from accumulating conductive dust particles that might eventually cause a short.

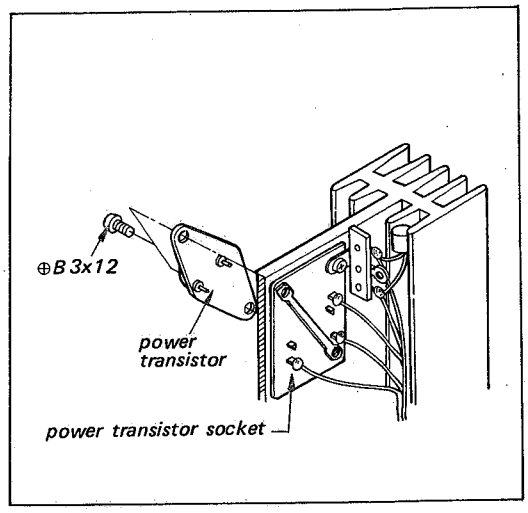


Fig. 2-6. Power transistor replacement

2-8. REAR PANEL REMOVAL

1. Remove the top cover as described in Procedure 2-3.
2. Remove the four self-tapping screws (⊕B 3x6) at the rear bottom of the chassis as shown in Fig. 2-3. This frees rear panel.

2-9. REPLACEMENT OF COMPONENTS SECURED TO THE REAR PANEL BY RIVETS

1. Remove the rear panel as described in Procedure 2-8.
2. Bore out the rivets using a drill bit slightly larger in diameter than the rivet. See Fig. 2-7.
3. Punch out the remainder of the rivet with a nail set or prick punch.
4. Remove the defective component, and then install a new one.
5. Secure the new component with a suitable screw and nut, or a repair rivet screw (part number 3-701-402).

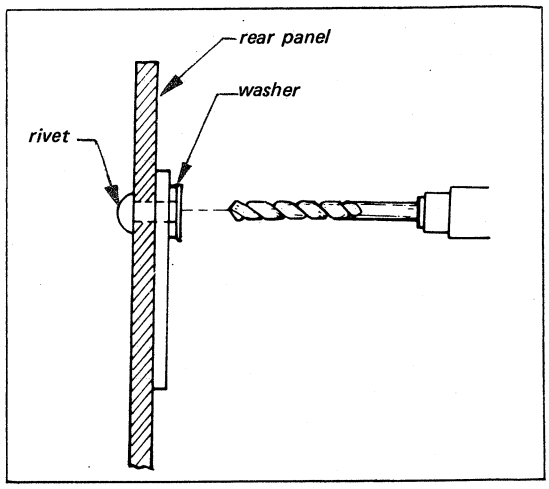
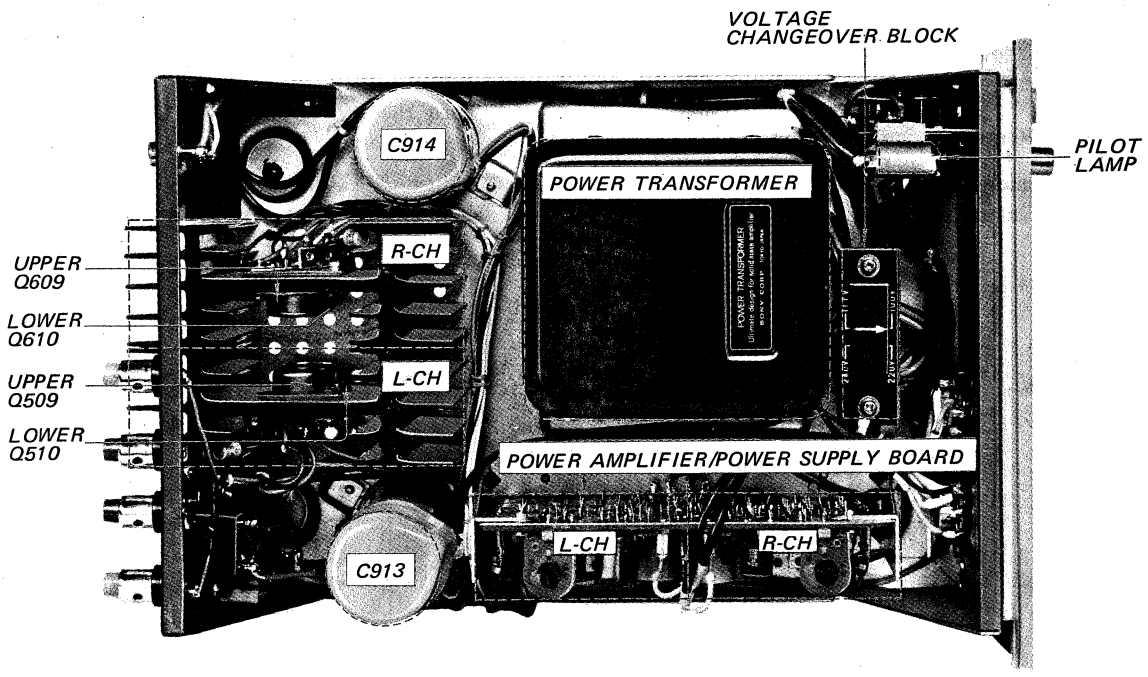


Fig. 2-7. Rivet replacement

2-10. CHASSIS LAYOUT



SECTION 3
POWER AMPLIFIER ADJUSTMENT

3-1. DC BIAS ADJUSTMENT

Note: There are usually two adjustments to be made in the power amplifier. One is dc-bias adjustment and the other is dc-balance adjustment. These adjustments should be alternately repeated two or three times after replacing any of the power transistors until best operation is obtained. In this case, only the dc-bias adjustment is described as the newly developed circuit made it possible to eliminate dc-balance adjustment.

CAUTION

To avoid accidental power transistor damage, increase the ac line voltage gradually, using a variable transformer, while measuring the voltage across test points as shown in Fig. 3-1. Check to see that the reading does not exceed 50 mV. If it does, turn off the power as soon as possible, then check and repair the trouble in the power amplifier board.

Test Equipment Required

1. Dc millivoltmeter
   Capable of measuring dc voltage of 100 mV or less.
2. Variable transformer
3. Screwdriver with 3 mm (1/8") blade

Preparation

1. Remove the top cover as described in Procedure 2-3.
2. Connect the dc millivoltmeter across the test terminal post as shown in Fig. 3-1.

Procedure

1. Apply a drop of cement solvent to the semi-fixed resistors on the power amplifier board, and then set the semi-fixed resistors (See Fig. 3-2) on the power amplifier board as follows:
   R514 (L-CH, dc-bias) ..... fully clockwise
   R614 (R-CH, dc-bias) ..... fully clockwise
2. Set the variable transformer for minimum output.
3. Turn the power switch to ON, and then increase the line voltage up to the rated value.
4. Adjust R514 and R614 to obtain a 50 mV reading on the meter.

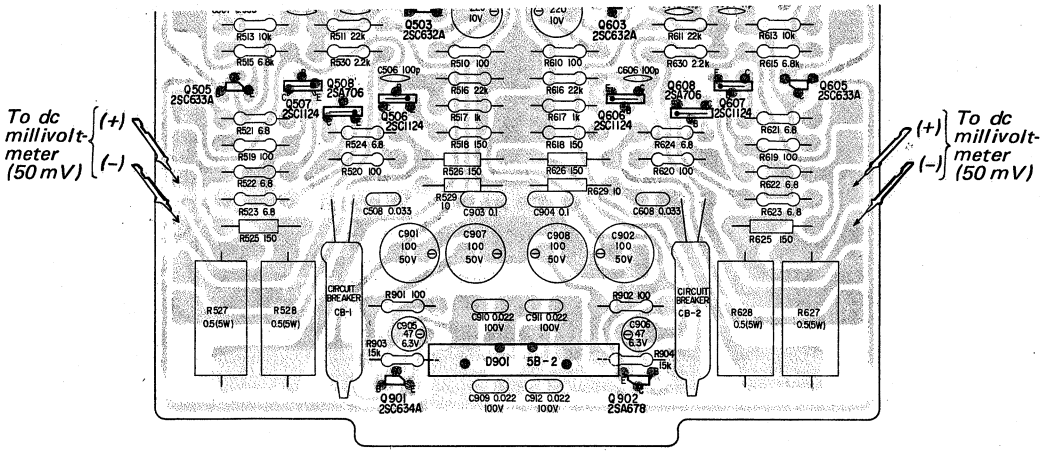


Fig. 3-1. Dc millivoltmeter connection

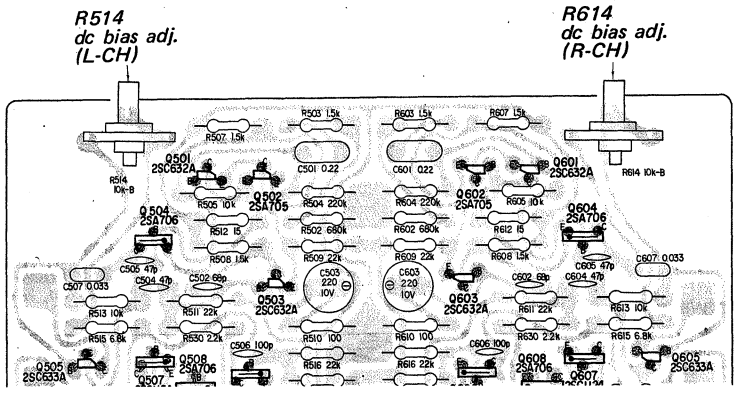


Fig. 3-2. Parts location

MEMO

SECTION 4
REPACKING

The TA-3140F's original shipping carton and packing materials are the ideal container for shipping the unit. However to secure the maximum protection, the TA-3140F must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 4-1.

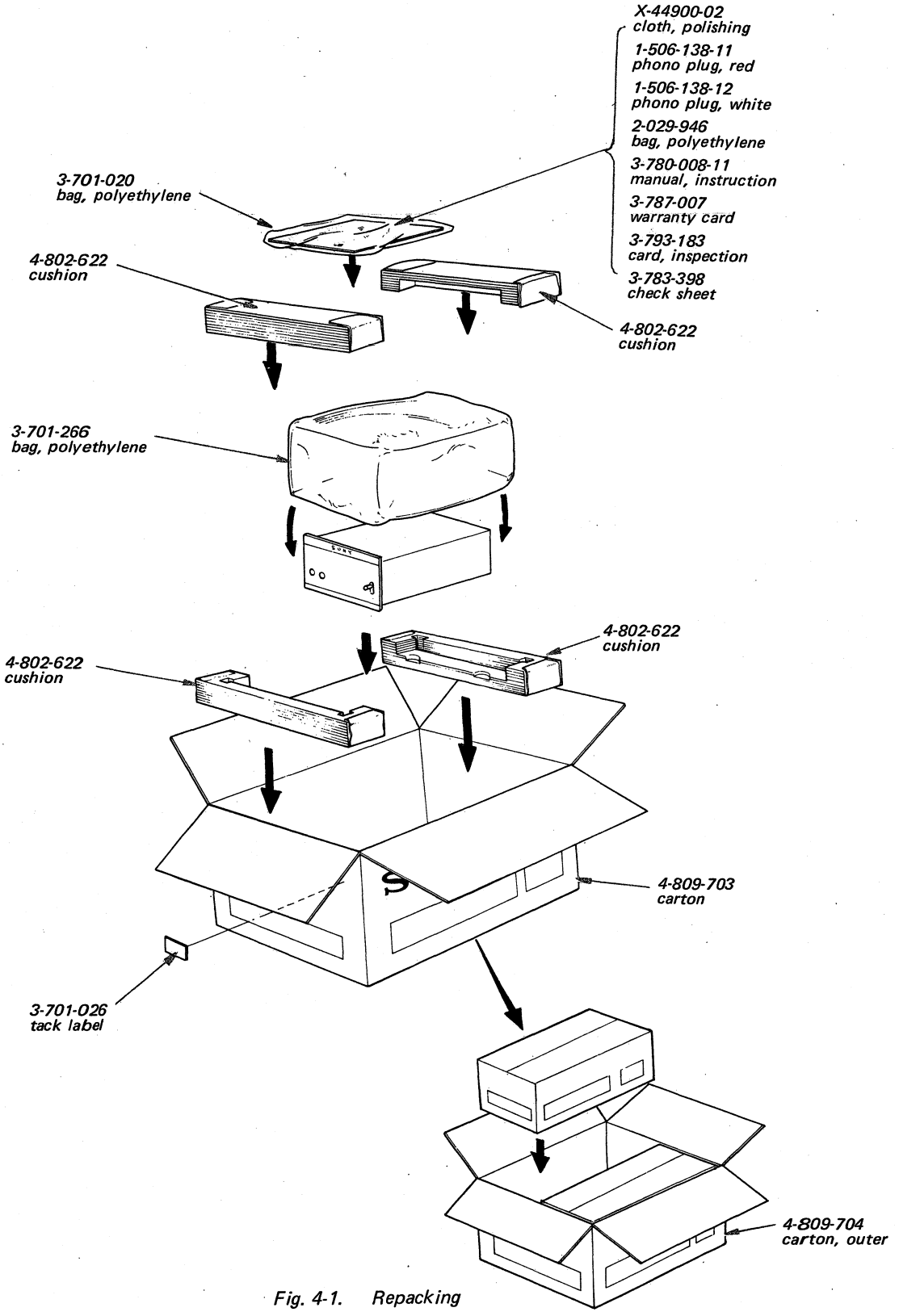
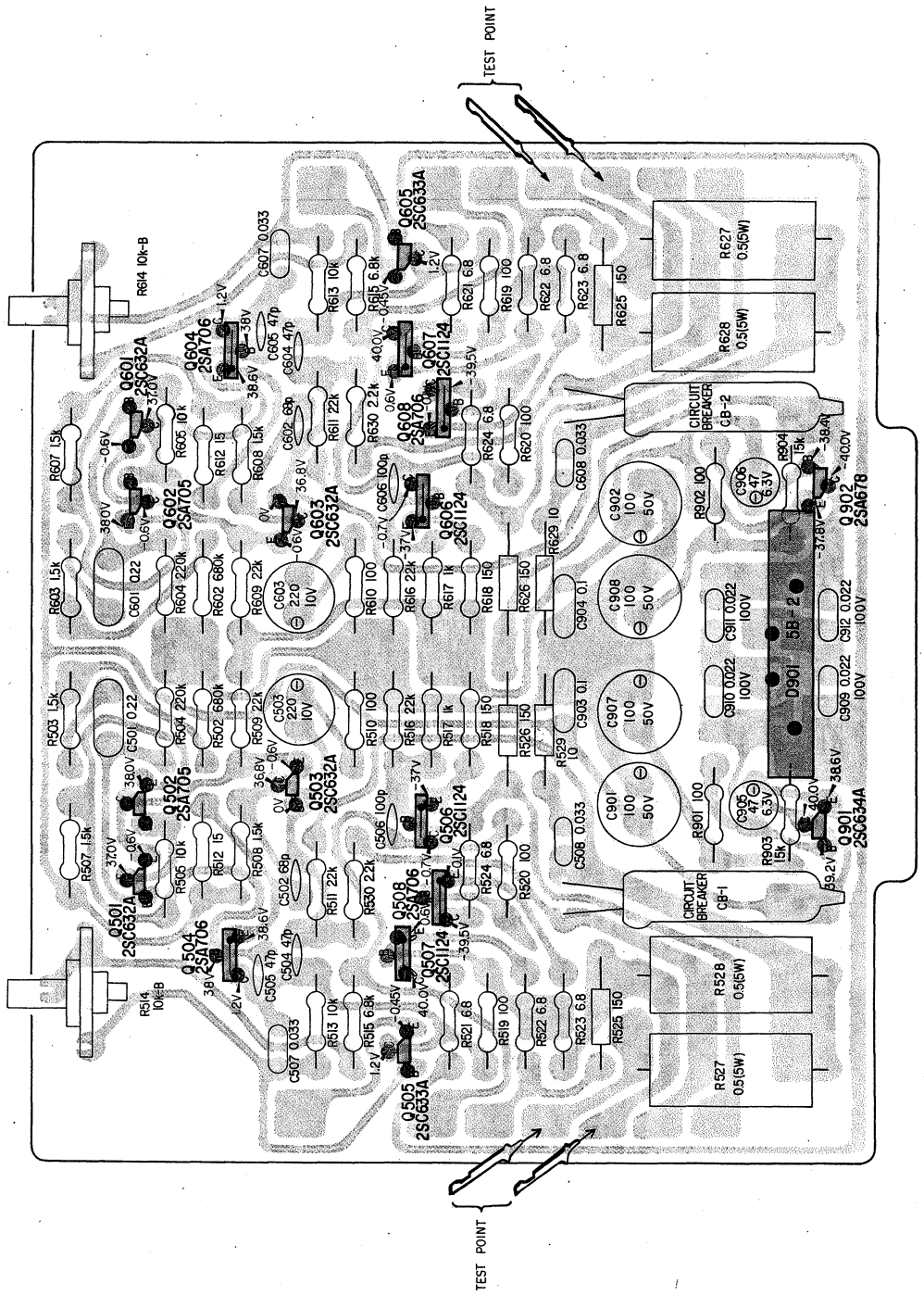


Fig. 4-1. Repacking

SECTIONS 5
DIAGRAMS

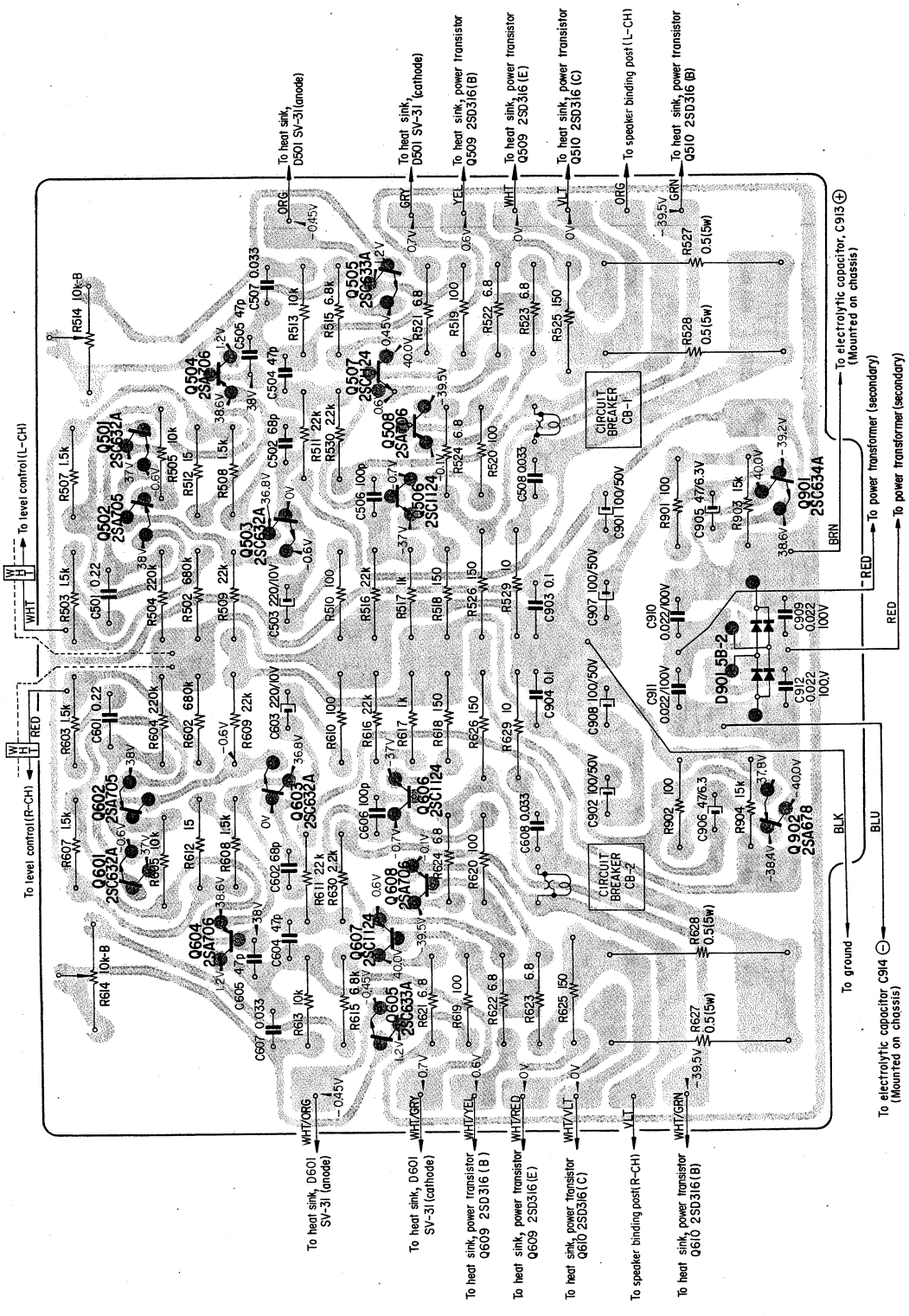
5-1. MOUNTING DIAGRAM – Power Amplifier/Power Supply Board –

– Component Side –

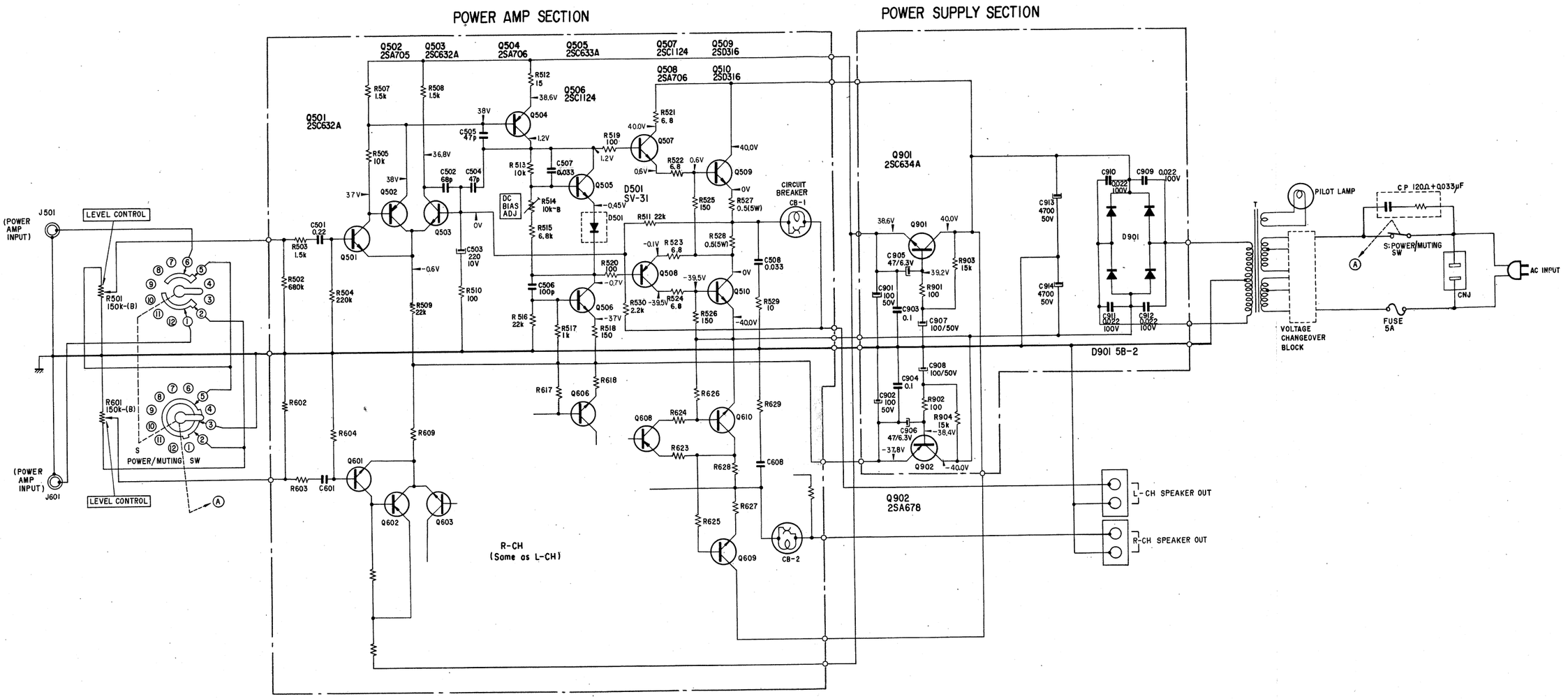


5-1. MOUNTING DIAGRAM — Power Amplifier/Power Supply Board —

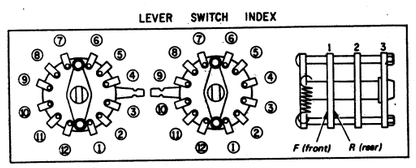
— Conductor Side —

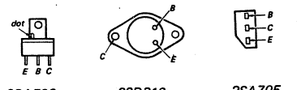

To level control (L-CH)
To level control (R-CH)
WHT
RED
To heat sink, D501 SV-31 (anode)
To heat sink, D501 SV-31 (cathode)
To heat sink, power transistor Q509 2SD316 (B)
To heat sink, power transistor Q509 2SD316 (E)
To heat sink, power transistor Q510 2SD316 (C)
To speaker binding post (L-CH)
To heat sink, power transistor Q510 2SD316 (B)
To heat sink, D601 SV-31 (anode)
To heat sink, D601 SV-31 (cathode)
To heat sink, power transistor Q609 2SD316 (B)
To heat sink, power transistor Q609 2SD316 (E)
To heat sink, power transistor Q610 2SD316 (C)
To speaker binding post (R-CH)
To heat sink, power transistor Q610 2SD316 (B)
To ground
To electrolytic capacitor C914 ⊖ (Mounted on chassis)
To electrolytic capacitor, C913 ⊕ (Mounted on chassis)
To power transformer (secondary)
To power transformer (secondary)
CIRCUIT BREAKER CB-1
CIRCUIT BREAKER CB-2
D901 5B-2
Q501 2SC632A
Q502 2SA705
Q503 2SC632A
Q504 2SA706
Q505 2SC633A
Q506 2SC1124
Q507 2SC1124
Q508 2SA706
Q601 2SC632A
Q602 2SA705
Q603 2SC632A
Q604 2SA706
Q605 2SC633A
Q606 2SC1124
Q607 2SC1124
Q608 2SA706
Q901 2SC634A
Q902 2SA678

5-2. SCHEMATIC DIAGRAM



Ref. No.	Description	Position
S	POWER/MUTING SW (ON-OFF)	ON





Note:

All resistance values are in ohms. k = 1000, M = 1000k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20%.

All voltages are dc measured with a VOM which has an input impedance of 20k ohms/volt. No signal in.

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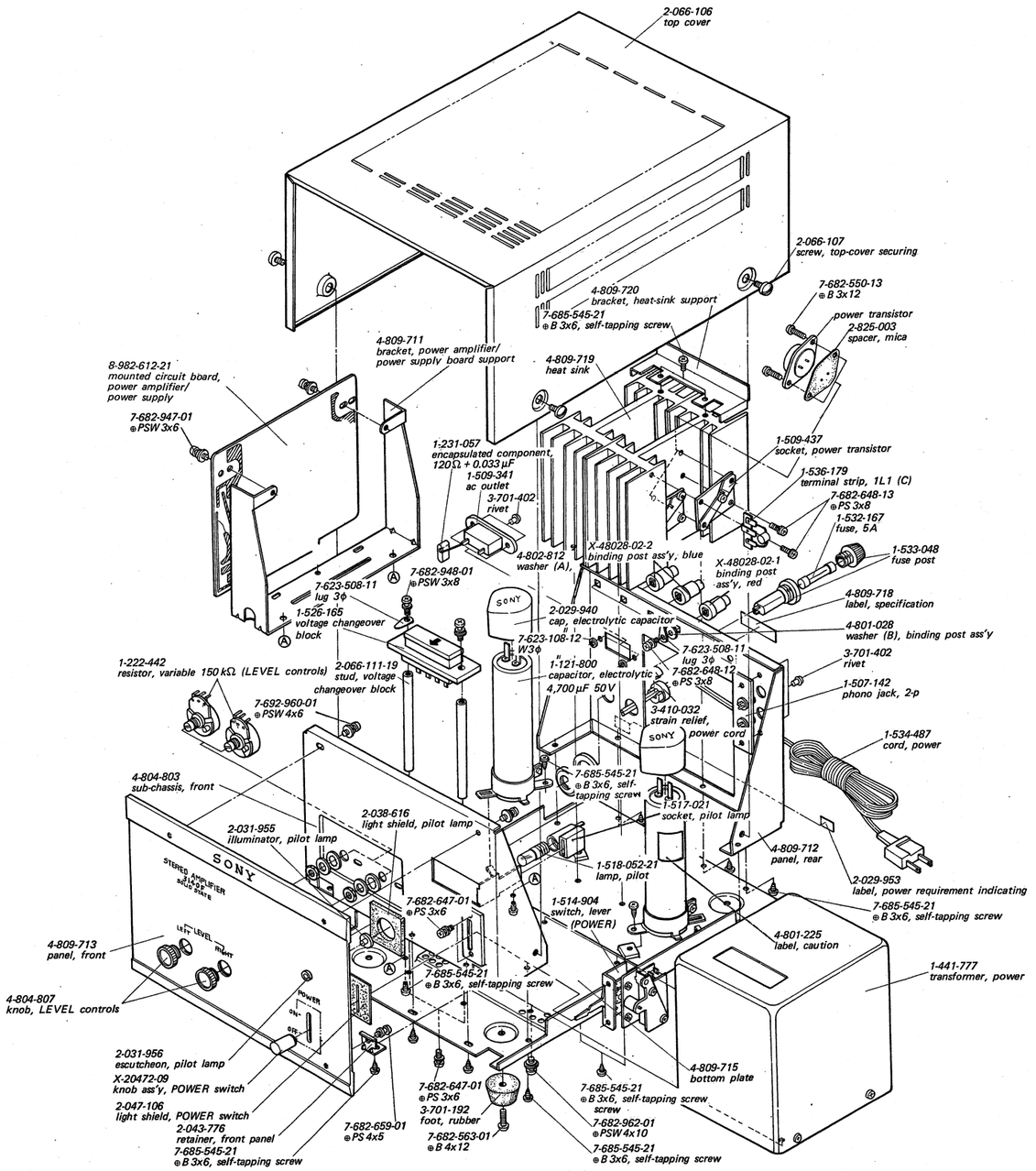
SECTION 6
EXPLODED VIEW



SECTION 7
ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description
		MOUNTED CIRCUIT BOARD
	8-982-612-21	power amplifier/power supply circuit board
		SEMICONDUCTORS
D501(D601)		varistor, SV-31
D901		diode, 5B-2
Q501(Q601)		transistor, 2SC632A
Q502(Q602)		transistor, 2SA705
Q503(Q603)		transistor, 2SC632A
Q504(Q604)		transistor, 2SA706
Q505(Q605)		transistor, 2SC633A
Q506(Q606)		transistor, 2SC1124
Q507(Q607)		transistor, 2SC1124
Q508(Q608)		transistor, 2SA706
Q509(Q609)		transistor, 2SD316
Q510(Q610)		transistor, 2SD316
Q901		transistor, 2SC634A
Q902		transistor, 2SA678
		TRANSFORMER
	1-441-777	transformer, power

CAPACITORS

All capacitance values are in μF except as indicated with p, which means μμF.

C501(C601)	1-105-689-12	0.22	±20%	100V	mylar
C502(C602)	1-101-888	68 p	±5%	50V	ceramic
C503(C603)	1-121-420	220	$\pm^{100}_{10}$%	10V	electrolytic
C504(C604)	1-101-880	47 p	±5%	50V	ceramic
C505(C605)	1-101-880	47 p	±5%	50V	ceramic
C506(C606)	1-101-973	100 p	±5%	50V	ceramic
C507(C607)	1-105-679-12	0.033	±10%	50V	mylar
C508(C608)	1-105-679-12	0.033	±10%	50V	mylar
C901(C902)	1-121-417	100	$\pm^{100}_{10}$%	50V	electrolytic
C903(C904)	1-105-685-12	0.1	±10%	50V	mylar
C905(C906)	1-121-407	47	$\pm^{100}_{10}$%	6.3V	electrolytic
C907(C908)	1-121-417	100	$\pm^{100}_{10}$%	50V	electrolytic
C909(C910)	1-105-877-12	0.022	±20%	100V	mylar
C911(C912)	1-105-877-12	0.022	±20%	100V	mylar
C913(C914)	1-121-800	4,700	$\pm^{100}_{10}$%	50V	electrolytic

RESISTORS

All resistance values are in ohms, ±5%, ¼W and carbon type, unless otherwise indicated

R501(R601)	1-222-442	150 k (B), variable (LEVEL control)				
R502(R602)	1-244-741	680 k				
R503(R603)	1-244-677	1.5 k				
R504(R604)	1-244-729	220 k				
R505(R605)	1-244-697	10 k				
R507(R607)	1-244-677	1.5 k				
R508(R608)	1-244-677	1.5 k				
R509(R609)	1-244-705	22 k				
R510(R610)	1-244-649	100				
R511(R611)	1-244-705	22 k				
R512(R612)	1-244-629	15				
R513(R613)	1-244-697	10 k				
R514(R614)	1-221-967	10 k (B) semi-fixed (dc bias adj.)				
R515(R615)	1-244-693	6.8 k				
R516(R616)	1-244-705	22 k				
R517(R617)	1-244-673	1 k				
R518(R618)	1-244-653	150				
R519(R619)	1-244-649	100				
R520(R620)	1-244-649	100				
R521(R621)	1-244-621	6.8				
R522(R622)	1-244-621	6.8				
R523(R623)	1-244-621	6.8				
R524(R624)	1-244-621	6.8				
R525(R625)	1-202-553	150	±10%	½W	composition	
R526(R626)	1-202-553	150	±10%	½W	composition	
R527(R627)	1-205-803	0.5	±10%	5W	wire-wound	
R528(R628)	1-205-803	0.5	±10%	5W	wire-wound	
R529(R629)	1-202-525	10	±10%	½W	composition	
R530(R630)	1-244-681	2.2 k				
R901(R902)	1-244-649	100				
R903(R904)	1-244-701	15 k				
		SWITCH				
	1-514-904	switch, lever (POWER/MUTING) with micro switch				
		MISCELLANEOUS				
CP	1-231-057	encapsulated component, 120Ω + 0.033 μF				
J501, J601	1-507-142	phono jack, 2-p				
CNJ	1-509-341	AC outlet				
	1-509-437	socket, power transistor				
	1-517-021	socket, pilot lamp				
	1-518-052-21	lamp, pilot				
	1-526-165	voltage changeover block				
	1-532-167	fuse 5 A				
CB-1, CB-2	1-532-320	circuit breaker				
	1-533-048	fuse post				
	1-534-487	cord, power				
	1-536-179	terminal strip, 1L1 (C)				

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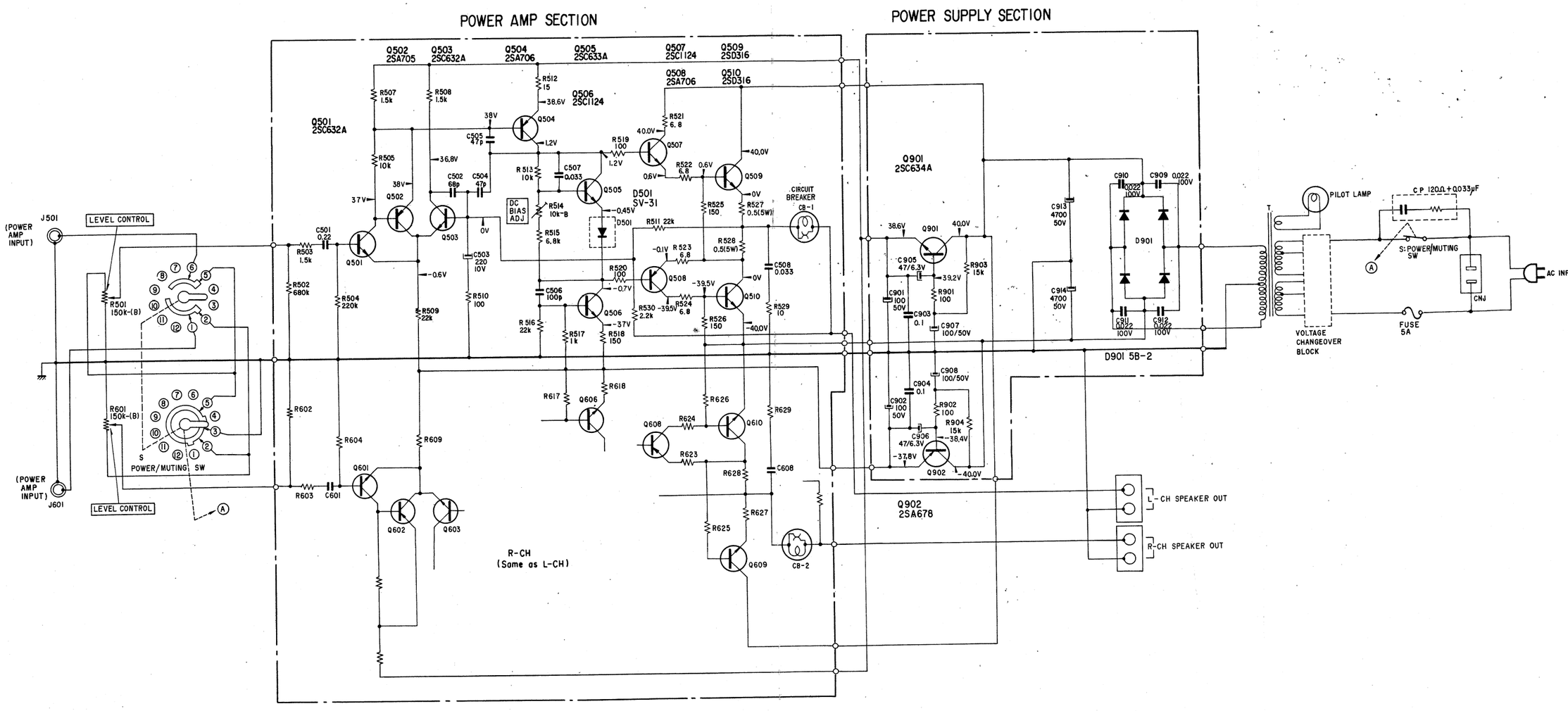
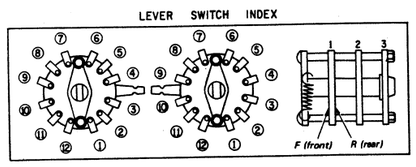
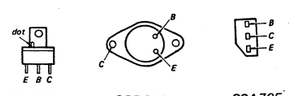
SCHEMATIC DIAGRAM



Ref. No.	Description	Position
S	POWER/MUTING SW (ON-OFF)	ON





2SA706
2SC1124

2SD316

2SA705
2SA678
2SC632A
2SC633A
2SC634A

Note:

All resistance values are in ohms. k = 1000, M = 1000k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20%.

All voltages are dc measured with a VOM which has an input impedance of 20k ohms/volt. No signal in.

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